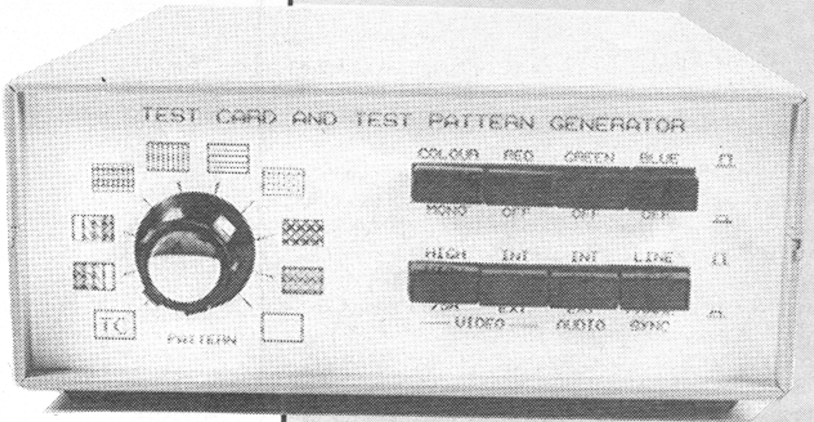


comprehensive is really required. The instrument featured here provides an impressive range of patterns including a full colour Test-Card, colour bars, cross-hatch, grey-scale, focus grip, colour purity patterns and more — for considerably less cost than a commercial unit of lower specification!

The unit also features a basic sine-wave audio oscillator, set at 800Hz. The audio oscillator, set at 800Hz. The audio and video outputs are available from the audio and video output sockets and, for more modern equipment, the SCART socket. An RF modulator is provided for connection to the aerial socket of UK standard Televisions and Video

1 Video Test Card And Test Pattern Generator

Paul Stenning introduces an invaluable aid to TV servicing.

There have been several designs of test pattern generators published in the past, invariably they produce the standard cross-hatch pattern, possibly horizontal and vertical lines, and may be a grey-scale. Most current designs are based around the ZNA234E monochrome test pattern generator IC.

This is adequate for monochrome (black and white) equipment, however for servicing colour televisions and video recorders, something a little more

Recorders (readers in other countries using the PAL standard may need to obtain a suitable type of modulator locally). The audio and video signals to the modulator are individually switchable to either the internally generated signals or to the external audio and video input and SCART sockets.

A Scope Trigger Output socket is provided to give reliable triggering on an oscilloscope when trying to view the video signals, the output from this can be switched to either line or frame sync.

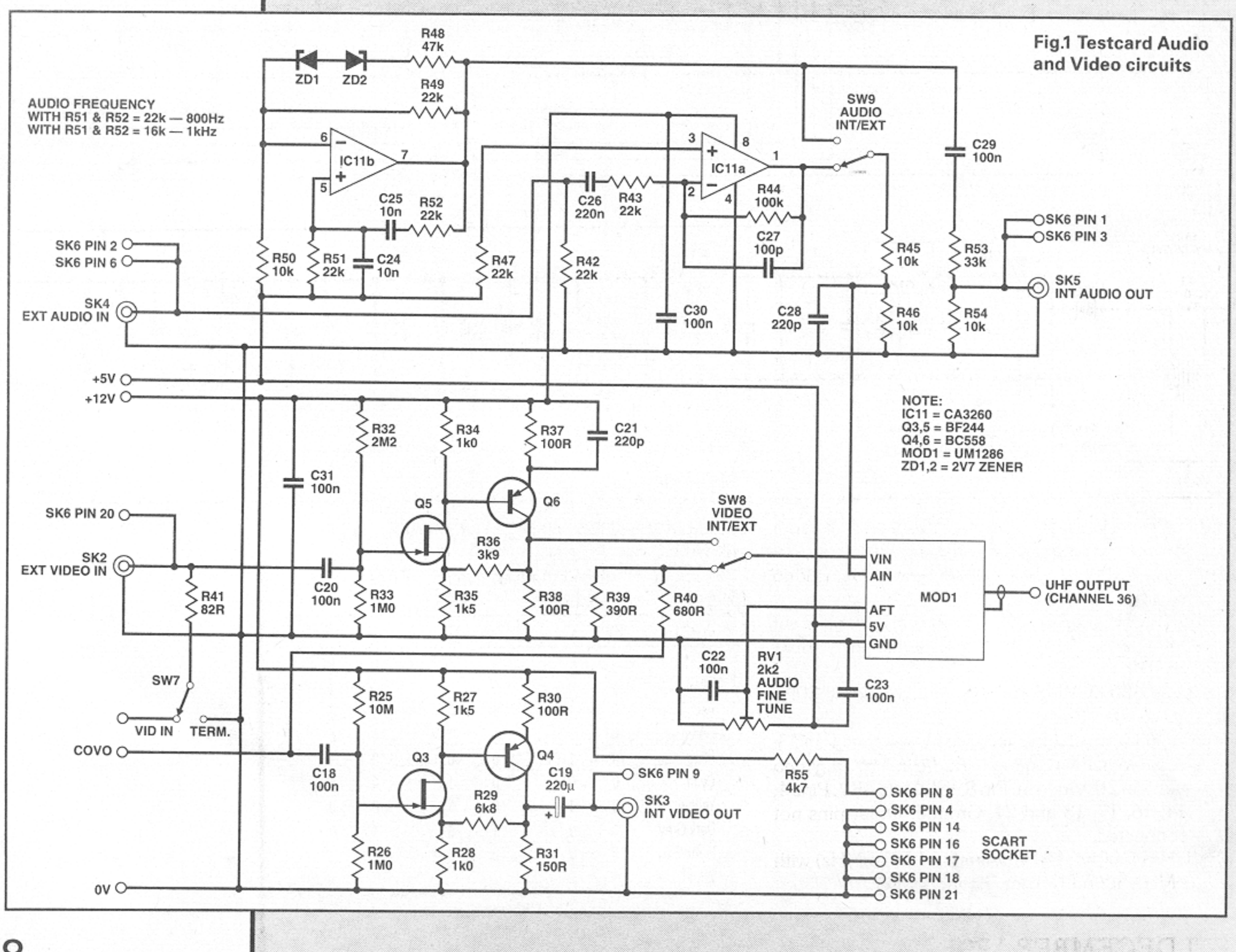


Fig.1 Testcard Audio and Video circuits

Features and Specifications

Test Card: Full colour Test-card featuring colour bars, grey scale (0%, 25%. 50%. 75% and 100%), frequency bars (0.5, 1.0, 1.25, 1.66, 2.5 and 5.0MHz), cross hatch, low frequency blocks and needle pulse.

Other Patterns: Colour bars 1 (black to white), Colours bars 2 (white to black), Cross hatch, Vertical lines, Horizontal lines, Dots, Focus grid, Blank raster, White raster.

Colour/Mono Switch: Removes chrominance (colour information) from Video signal, thereby converting colour bars to grey scale, and removing herringbone patterns.

Red/Green/Blue Switches: Completely remove information for that colour from video signal.

Internal Audio: 800 Hertz (nominal) Sine wave.

Scope Trig Output: 5V Pk-Pk at 10k, switchable Line or Frame.

Power Input: 240V AC 50Hz at 6VA or 11-13V DC at 120mA (see text).

The PAL colour encoder (IC9) is capable of producing 64 colours, however for this application only 10 are required. There are 2 data lines on IC9 for each of the 3 primary colours, labeled R0 and R1 for red, G0 and G1 for green and B0 and B1 for blue. Taking the red lines for example, if R0 only is high a fairly dark red (50% of maximum brightness) is produced, if R1 only is high, the colour is brighter (75% of maximum brightness), if R0 and R1 are both high the colour is maximum brightness (saturated, the same brightness as white), and if R0 and R1 are both low no red is produced. The same arrangement applied for the green and blue data lines. By applying various codes to the data lines, the primary colours can be mixed in various combinations to produce an impressive range of colours.

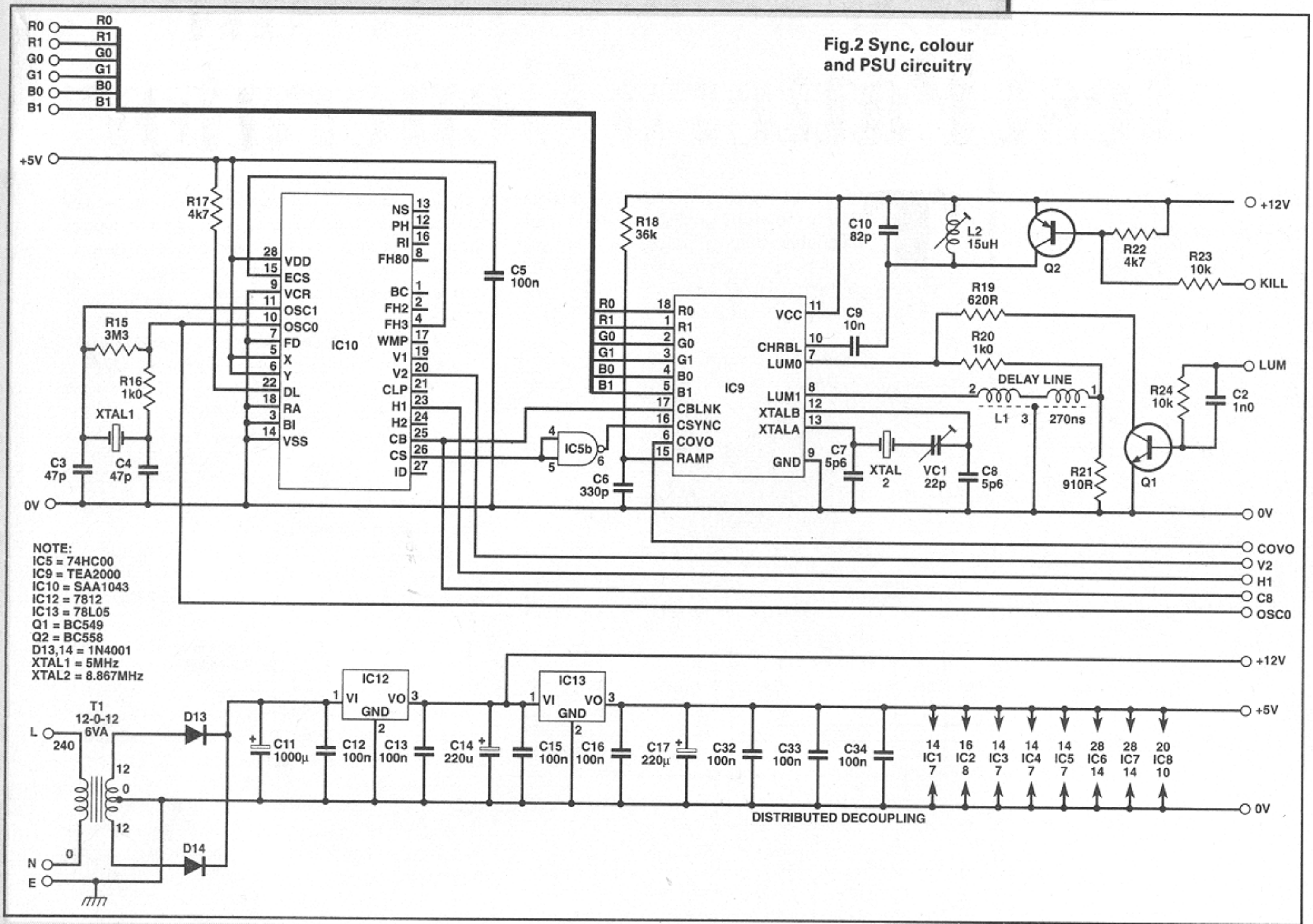


Fig.2 Sync, colour and PSU circuitry

Video Out: 1V Pk-Pk PAL Composite video from pattern generator, BNC socket.

Audio Out: 500mV RMS, 800Hz Sine Wave, Phono socket.

Video In: 1V Pk-Pk PAL Composite video, Input Impedance 75R or 500k switchable, BNC Socket.

Audio In: 500mV RMS into 10k, Phono socket, 30Hz to 15kHz ±3dB.

SCART Socket: All signal levels as above. Pins 1 and 3, Audio out. Pins 2 qand 6, Audio in. Pin 19, Video out. Pin 20, Video in. Pin 8, +12V via 4K7. Pins 4, 14, 16, 17, 18 and 21, Ground. Other pins not connected.

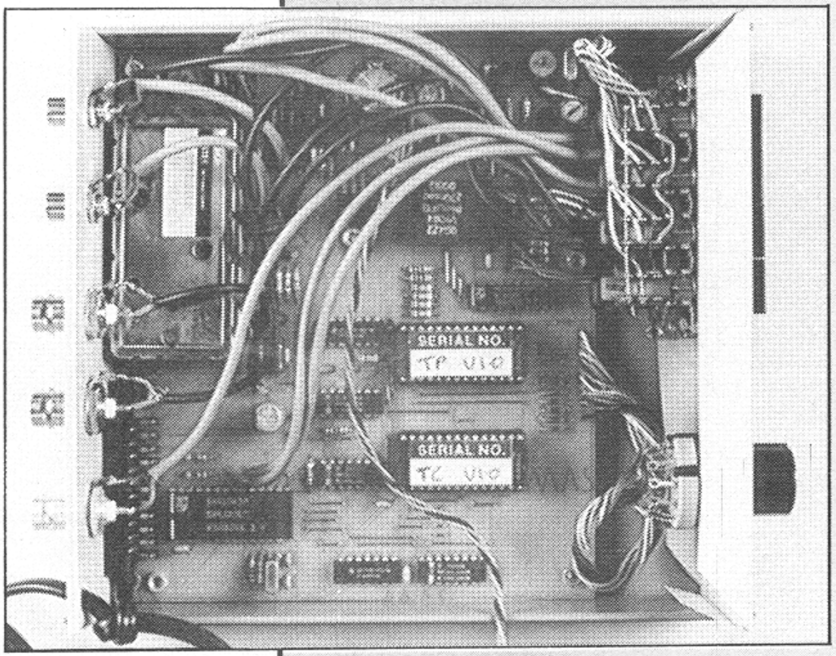
RF (UHF) Output: UK Channel 36 (591.5MHz) with 6MHz Sound Carrier. Phono socket.

The truth table below shows the codes required for the ten colours used in this application:

Colour	R0	R1	G0	G1	B0	B1
Black	0	0	0	0	0	0
Blue	0	0	0	0	0	1
Red	0	1	0	0	0	0
Green	0	0	0	1	0	0
Magenta	0	1	0	0	0	1
Cyan	0	0	0	1	0	1
Yellow	0	1	0	1	0	0
Dark Grey	1	0	1	0	1	0
Light Grey	0	1	0	1	0	1
White	1	1	1	1	1	1

From the above truth table it can be seen that all the colours except black, white and grey are used at the 75% brightness level, this level is chosen mainly because a good grey-scale is produced if the colour bar pattern is selected and the chrominance (colour information) is disabled. The logic levels on lines R0, C0 and B0 are always the same, these 3 lines therefore share one data line (D0) from the EPROMs, leaving more data lines available for other purposes, R1, G1 and B1 are connected to data lines D1, D2 and D3 respectively.

Unfortunately the TEA2000 (IC9) will only produce two shades of grey, 50% and 75%, for the test card an additional grey at 25% is required. This is achieved using Q1 and R19 to reduce the luminance signal level at the luminance delay line. This transistor is controlled by data line D4, when the 25% grey is required, the 50% grey is selected and D4 is taken high (a slight problem with this arrangement is that when the test card pattern is selected, and all three colours are switched off, a faint pattern will still be present,



however since the instrument would never be used in this manner, it was not considered important).

The power supply uses a standard 12-0-12 volt centre tapped mains transformer, with full-wave rectification, giving about 17 volts DC across C11. This is regulated to 12 volts and 5 volts using two standard 3-pin regulator ICs (IC12 and IC13).

If requird T1 could be removed, IC12 linked out, and the circuit powered from 12 volt (±1 volt) batteries for portable use. Current consumption at 12 volts is about 120mA, so a small rechargable sealed lead-acid battery would be a good choice. The maximum supply voltage for IC9 is 13.2 volts, so ensure this is never exceeded (disconnect the battery when charging).

Construction

All the components except the switches, sockets SK1 to SK5, mains transformer T1 and resistor R4 are mounted on the PCB. This is a single sided board, about 185 × 165mm in size, and will be available from the ETI PCB service next month. There are 45 links and it is advisable to fit these first, using tinned copper wire, about 24 SWG. The remaining components can then be fitted in the usual size order. Note that there are tracks between many of the IC pins so a fine tipped soldering iron and due care should be used. All the ICs except IC12 and IC13 (the regulators) should be fitted in sockets, and should not be inserted until the power supply voltages have been checked — see Testing and Setting-up next month. Veropins may be used for the off-board connections if desired. Take care particularly when fitting the inductors, crystals and variable capacitor since they are easily damaged by rough handling and excessive heat. When fitting the modulator, ensure it is well down, then twist the mounting tags by about 45° and solder. Do not connect the wires from the modulator to the board until the power supply voltages have been checked.

The prototype was housed in a plastic case approximately 170 × 70 × 190mm, however this was

HOW IT WORKS

Most of the difficult work is done by IC9 (TEA2000), the PAL Colour Encoder IC, and surrounding circuitry (see Figure 2). This IC produces the luminance (brightness) and chrominance (colour) signals and combines them to form the PAL standard composite video output. The IC requires 6 bit colour data, giving a total of 64 possible colours; it also requires composite sync and blanking signals which are produced by IC10 (SAA1043), a Universal Sync Generator IC. Various other signals are obtained from IC10 for use as clock and timing signals for the remainder of the logic circuitry. The H1 and V2 signals from this IC go to SW1, which selects the signal to connect to SK1 (Scope Trig Socket) via R4. The colour data required by IC9 is stored in EPROMs IC6 & IC7. IC6 contains the data for the test card whilst IC7 contains the data for the other patterns.

The address lines of the EPROMs, IC6 & IC7 are controlled by two counter IC's, IC2 & IC3 (note that only one EPROM, either IC6 or IC7, is selected at any one time, depending on the position of SW2). The first counter, IC2 (74HC4040), is clocked by a 5MHz clock signal taken from the crystal (XH1) of IC10 (via IC1b); the counter is reset at the end of each scan line by the composite blanking signal (CB), also from IC10. This counter controls the EPROM address lines A0 to A7. During the non-blanked period of a scanned line (when CB is low) there are actually 258 clock pulses, so lines A0 to A7 count up from 0 to 256 (00h to 0 and 1 (00h and 01h) again. The fact that the first two "pixels" in each line are repeated again at the end of the line is of no consequence since this has been allowed for when planning the pattern data.

A second counter chip, IC3 (74HC4024), is normally clocked on each line by the composite blanking signal (via IC5a), and reset at the end of each frame by the V2 (Vertical Pulse 2) signal, also from IC10. Six output lines from IC3 control the remaining six address lines on IC6 (we will come to IC7 later), however since there are only six address lines this gives a maximum count of only 64 lines. Since there are about 280 visible lines per half frame (remember the 625 lines are made up over 2 frames), some means of obtaining the 280 lines is required. The obvious approach would have been to use larger EPROMs (more address lines), however these could be difficult to obtain and get programmed, and would make the unit more complex and expensive than planned. The Test-Car pattern has many sections where one line is repeated several times over, so the following arrangement was designed, where the same data in the EPROM could be used for several lines if required. If data line D7 goes high the rising edge resets another counter, IC4 (74HC4024), via C2 and R2. Output line Q5 of this IC goes low which switches the CB signal off of IC3 and on to IC4, via IC5a and IC1b. After 16 pulses on the CB line, line Q5 goes high again, switching the CB signal back onto IC3. Therefore if D7 is high during a picture line, that line is repeated 16 times. With careful pattern programming the 64 sets of line data produed the required full 280 line picture.

The above arrangement is fine for IC6, the Test-Card EPROM, which only contains one frame, IC7 on the other hand contains the data for 8 patterns. However these other patterns are made up of only 8 picture lines repeated several times over to make up the frame. Therefore only the lower 3 address lines from IC3 need to be connected to counter IC7, the upper 3 address lines from IC7 are connected to positions 2 to 8 of SW2 (Pattern Select), via diodes D3 to D11, which act as an 8 into 3 line binary decoder, in conjunction with pull-up resistors R6 to R8. Switch position 1 selects IC6 and disables IC7, giving the Test-card pattern.

The data line outputs of IC6 and IC7 are connected to an 8 bit D-type latch, IC8 (74HC574). This latch is clocked by the 5MHz clock via IC1c. The main purpose of this is to remove the effects of the propagation delays of a little tight for comfort. Since the instrument is mains powered, a slightly larger earthed metal case would be more suitable. The PCB is mounted at the rear of the case, with cut-outs in the rear panel for the SCART socket and the UHF output socket on the modulator. The other sockets are also mounted on the rear panel.

All the switches are mounted on the front panel, a suitable legend for this will be featured next month. Switch SW2 is a rotary type, 1-pole 12-way, with the stop set at position 10 (note that no connection is made to pin 10, although position 10 is used). The other switches are the Japanese type latching switches, and are mounted in two banks of four. The individual switch latches are left in place and the interlocking mechanism is not used.

Part 2 will feature more construction including the template for the front panel, the component overlay, the Parts List and an interwiring diagram.

IC2 and IC6/IC7, which would otherwise give rise to black vertical lines on the picture, particularly at points where several address lines are supposed to change state simultaneously. IC8 is also used to produce the 5MHz part of the frequency grating on the test-card. If line D6 is high the 5MHz clock signal is applied to the OE (Output Enable) pin of IC8, due to IC5c & IC5d. When this clock signal is high the outputs are disabled and are pulled low by resistors R11 to R14, when the clock is low the outputs are enabled and high due to D0 to D3 being high; thereby giving a 5MHz signal on all the colour data lines. The outputs of IC8 are also disabled (due to IC5 c) when SW2 is in position 9, giving the Blank Raster pattern.

The colour data outputs of IC8 connect to IC9 via switches SW3 to SW5. These switches enable each of the primary colours to be switched on or off independently.

If switch SW6 (Colour/Mono) is closed, Q2 is turned on which removes the chrominance from the signal by effectively shorting out the chrominance filter circuit (L2 & C10) of IC9.

The composite video output from IC9 (COVO), is attenuated by R39 and R40, and fed to SW8 (the Int/Ext Video switch); it is also buffered by a video amplifier comprising of Q3, Q4 and surrounding circuitry, and fed to the Video Output socket (SK3), and pin 19 of the SCART socket (SK6). The external video input from SK2 or pin 20 of SK6 amplified by another similar video amplifier circuit, built around Q5 & Q6. The input impedance of this amplifier is about 500k, but can be reduced to about 75R by closing SW7. The output of this amplifier circuit, built around Q5 & Q6. The input impedance of this amplifier is about 500K, but can be reduced to about 75R by closing SW7. The output of this amplifier is also fed to SW8. Either the internal or external video, as selected by SW8, goes to the RF modulator MOD1.

The audio oscillator is built around IC11b and is a standard Wein Bridge circuit, with zener diodes used to control the negative feedback. The output is connected to SW9; and also attenuated to 500mV RMS (by R53 and R54), and fed to the Int Audio Out socket (SK5), and pins 1 & 3 of the SCART socket (SK6). The frequency is set to 800Hz, but can be changed to 1kHz if required by reducing R51 and R52 to 16K.

The External Audio input is amplified by IC11a. The gain is arranged such that a 500mV input gives the same drive to the modulator as the internal audio generator. The bandwidth is limited to 30Hz-15kHz by C26 and C27. The output also goes to SW9, IC11 is powered from the 12 volt supply, with the 5 volt supply used as the mid-rail. The outputs are about 8 volts peak-to-peak, centered at the 5 volt level. SW9 selects either the internal or external audio, and R45 & R46 reduce the level to about 4 volts peak to peak, centered at 2.5 volts, which is the correct level for the RF modulator, MOD1. C28 removes the small amount of 6MHz carrier signal that seems to come out of the modulator's audio input, and would otherwise find its way onto the Audio Output socket. RV1 is the 6MHz audio carrier fine tuning control.

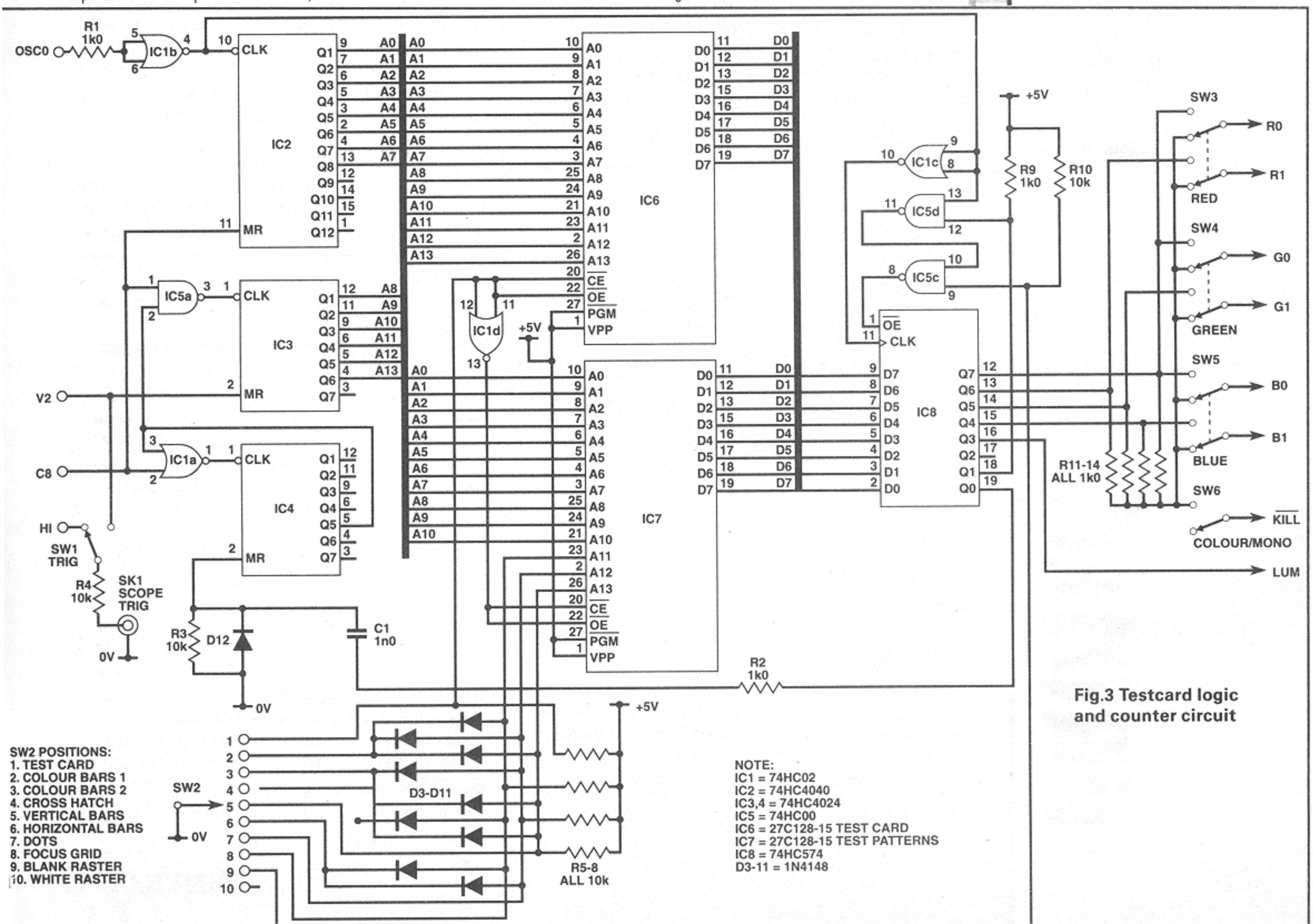


Fig.3 Testcard logic and counter circuit

Video Test Card And Test Pattern Generator

2

In this second part, Paul Stenning continues construction of this aid to TV servicing.

PROJECT

In Part 1 of the Video test card generator we presented the circuitry and its operation. Continuing with the construction, the interwiring is shown in Figure 1, thin coax cable is used for all signal wiring (proper 75R coax could be used for the video but it is not too important with the lengths involved), and standard hook-up wire for the remaining connections. The mains connections should be insulated, and the flex secured in some manner. No mains on/off switch or fuse were fitted on the prototype, however they could be fitted if required. The mains plug should be fitted with a 3 amp fuse.

Testing and Setting-Up

Due to the cost of the modulator and some of the IC's it is a good idea to check that the power supply voltages are correct before fitting these parts. Make sure none of the IC's except IC12 and IC13 are fitted, and that the modulator is disconnected. Give the PCB a final visual check over, in particular watch for solder bridges between IC pads and the tracks between them.

Connect the instrument to the mains, and switch on. Set your test meter to 20 volts DC or thereabouts, and connect its negative lead to the case of the modulator. Check for 12 volts ± 0.5 volts on pin 11 of IC9 socket, and 5 volts ± 0.25 volts on pin 20 of IC8 socket. If all is well switch off and wait a minute or so for the power supply capacitors to discharge, then connect up the modulator and fit the IC's. Most of the IC's are CMOS types but have protected inputs so static damage is unlikely, however the usual handling precautions against static discharge should still be taken.

Set SW2 to position 1 (full ACW); SW3, SW4 & SW5 on, SW6 off and SW8 & SW9 to internal (all buttons out). Connect the RF output socket on the modulator to your TV, cross your fingers and switch on. You will probably need to tune your TV to channel 36, although the channel you use for your video recorder should be somewhere near. You should get an audio tone from the speaker and a test-card picture. Don't worry at this stage if there is a buzz on the sound or no colour in the picture.

To avoid damage to components and misleading results, always use a proper trim-tool when making adjustments. Adjust RV1 for minimum buzz (or to the middle of the area of no buzz) on the sound. Adjust VC1 until the colour locks on, then set to the centre of the range where you get colour. Finally adjust L2. If you have a 'scope connect it to the Video Output socket and adjust for maximum amplitude on the colour burst, otherwise adjust for brightest colour and minimum 'herringbone' pattern on the picture. All that remains now is to check the various functions of the unit as detailed below. Once the unit has been tested, the PCB can be fitted in the case, and the unit finished off.

In Use

Firstly a word of warning. Anybody attempting to repair or adjust television sets, whether using this instrument or not, must be aware of the hazards involved. Many sections of TV circuitry operate at dangerous voltages (in the range of 100V to 30kV), and in many cases the internal chassis and metalwork is also at a dangerous (mains) voltage. For maximum safety the set should always be powered via a mains isolating transformer. If a transformer is not used, no test equipment should be connected to the set, except to external sockets, and very great care should be taken when making adjustments with the power on (the practice of disconnecting the mains earth to all the test equipment is extremely dangerous and should never even be considered). In any event always work with one hand in your pocket when the set is on, even with an isolating transformer the high voltages can be lethal. Care should also be taken when working near the power supply of video recorders, although in this case the rest of the circuit usually operates at more civilized voltages. The use of an Earth Leakage Circuit Breaker on the mains feed to the bench is also a sensible precaution.

In most cases the instrument would be connected to the equipment under test via its aerial socket, since this enables the whole signal path to be checked, also a fault in the equipment is extremely unlikely to damage this instrument when connected this way. Once the equipment has been proved to be basically sound, the instrument could be connected by the video/audio or SCART connectors if required.

SW2 selects which basic pattern is produced, as follows:

1 Test Card
2 Colour Bars 1 (Black to White)
3 Colour Bars 2 (White to Black)
4 Cross Hatch
5 Vertical White Lines
6 Horizontal White Lines
7 White Dots
8 Focus Grid (Fine checker board pattern)
9 Blank Raster (Sync & 0% video)
10 White Raster (Sync & 100% video)

If SW6 (Colour/Mono) is pressed in, the colour information will be removed from the picture, this will convert the Colour Bars to Grey Scale, and remove the herringbone patterning on patterns such as the Cross Hatch.

Pressing SW3/SW4/SW5 will remove the Red/Green/Blue colour completely, this is the same effect as switching off that colour gun inside the TV (with all three off there will be no picture). If this is used in conjunction with the White Raster pattern, the sets colour purity can be adjusted. It is also useful for removing the blue from the Cross Hatch when starting to set up the convergence. (If SW3, 4 & 5 are all switched off when SW2 is set to the test-card pattern, a faint pattern will still be present — this should be ignored).

The features of the Test Card require further comment. The overall size of the picture is slightly smaller than the minimum size of a transmitted picture. The TV's picture height, width and position controls should be adjusted such the whole test card is shown, but with the tips of the corners very slightly hidden by the rounded corners of the tube (you may find that some cheaper sets have the width adjusted wider than this, this is because the width of the picture on these sets varies with brightness). The overall brightness of the Test Card is about that of an average picture. The background is dark grey (25%) with a White Cross pattern, to enable the linearity to be checked.

The main area of interest on the Test Card is the centre section. Starting at the top we have a black rectangle within white to check the LF response, and a white needle pulse to check for reflections and instability. Next we have a 250kHz, 100% to 0% square wave to test the transient response; and below this are the eight colour bars. Next there is a six step frequency grating with frequencies of 0.5, 1.0, 1.25, 1.66, 2.5 and 5.0MHz. These enable the frequency response of the video circuits to be checked, the gratings up to 2.5MHz should be clear and sharp, but many sets will have trouble resolving the 5.0MHz. Finally there is a five step grey scale for adjusting contrast, with amplitudes of 0%, 25%, 50%, 75% and 100%.

I will not go into further details of which adjustments should be made with which pattern, if you have the service manual for the equipment this will give suggestions, otherwise it's a matter of experience and taste — if the set will give an acceptable picture on all patterns there can't be much wrong! Some sets may have trouble locking onto the output from this unit, in this case try switching off the sets AFC and tuning manually. Remember that a test pattern is intended to show the worst in a piece of equipment, at the end of the day the picture should be acceptable to the viewer on a normal programme!

As it's name suggests, the Scope Trig socket can be used to externally trigger an oscilloscope when trying to view the video signals inside the equipment. The output is 5 volts peak-to-peak at 10k, and can be switched to either line or frame sync by SW1. Bear in mind, though, that the outer of this socket is earthed inside the unit so you may be earthing the TV's chassis via the 'scope leads.

When using the video and audio output sockets it should be noted that the signals from these are always the internally generated ones, regardless of the positions of the Int/Ext Video and Audio switches; these switches only affect the output from the RF modulator. This can be useful if, for example, a video recorder under test is connected to the SCART socket, and the RF output connected to the workshop TV. The signal from the generator can be compared to that from the video recorder merely by operating the Int/Ext switches (no more fumbling with RF leads behind the TV!). The unit can also be used to enable the composite video and/or audio outputs from equipment such as video cameras and computers (and certain satellite decoders!) to be fed to a normal TV via the aerial socket.

Care should always be taken, particularly when working on faulty equipment, to ensure that no excessive voltages are applied to the unit, as this will almost certainly cause expensive damage.

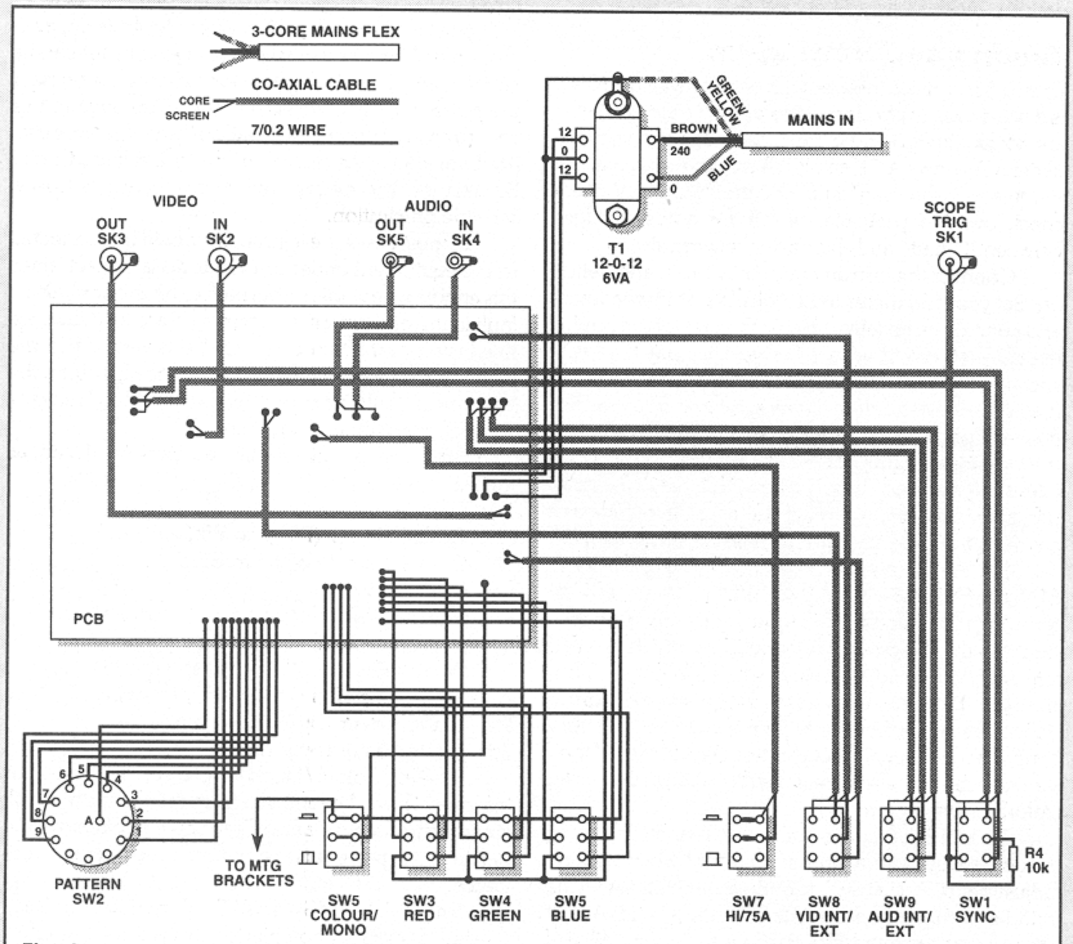


Fig.1 Interwiring diagram of Generator

PARTS LIST

RESISTORS (all 1/4 Watt 5% or better)

R1,2,9,11-14,16,20,28,34	1k0
R3-8,10,23,24,45,46,50,54	10k
R15	3M3
R17,22,55	4k7
R18	36k
R19	620R
R21	910R
R25	10M
R26,33	1M0
R27,35	1k5
R29	6k8
R30,37,38	100R
R31	150R
R32	2M2
R36	3k9
R39	390R
R40	680R
R41	82R
R42,43,47,49,51,52	22k
R44	100k
R48	47k
R53	33k
RV1	2k2 Horizontal Preset

CAPACITORS

C1,2	1n0 0.2″ pitch mylar
C3,4	47p 0.1″ pitch ceramic
C5,12,13,15,16,18,20,22,23,29-34	100n 0.2″ pitch disc ceramic
C6	330p 0.1″ pitch ceramic
C7,8	5p6 0.1″ pitch ceramic
C9,24,25	10n 0.2″ pitch mylar/ceramic
C10	82p 0.1″ pitch ceramic
C11	1000µ 25V radial elect
C14,17,19	220µ 16V radial elect
C21,28	220µ 0.1″ pitch ceramic
C26	220µ 0.2″ pitch disc ceramic
C27	100p 0.1″ pitch ceramic
VC1	22p Trimmer

INDUCTORS

L1	Delay Line 270ns
L2	15µH Adjustable

SEMICONDUCTORS

IC1	74HC02
IC2	74HC4040
IC3,4	74HC4024
IC5	74HC00
IC6,7	27C128-15 150ns EPROM
IC8	74HC574
IC9	TEA2000
IC10	SAA1043
IC11	CA3240
IC12	7812
IC13	78L05
Q1	BC548

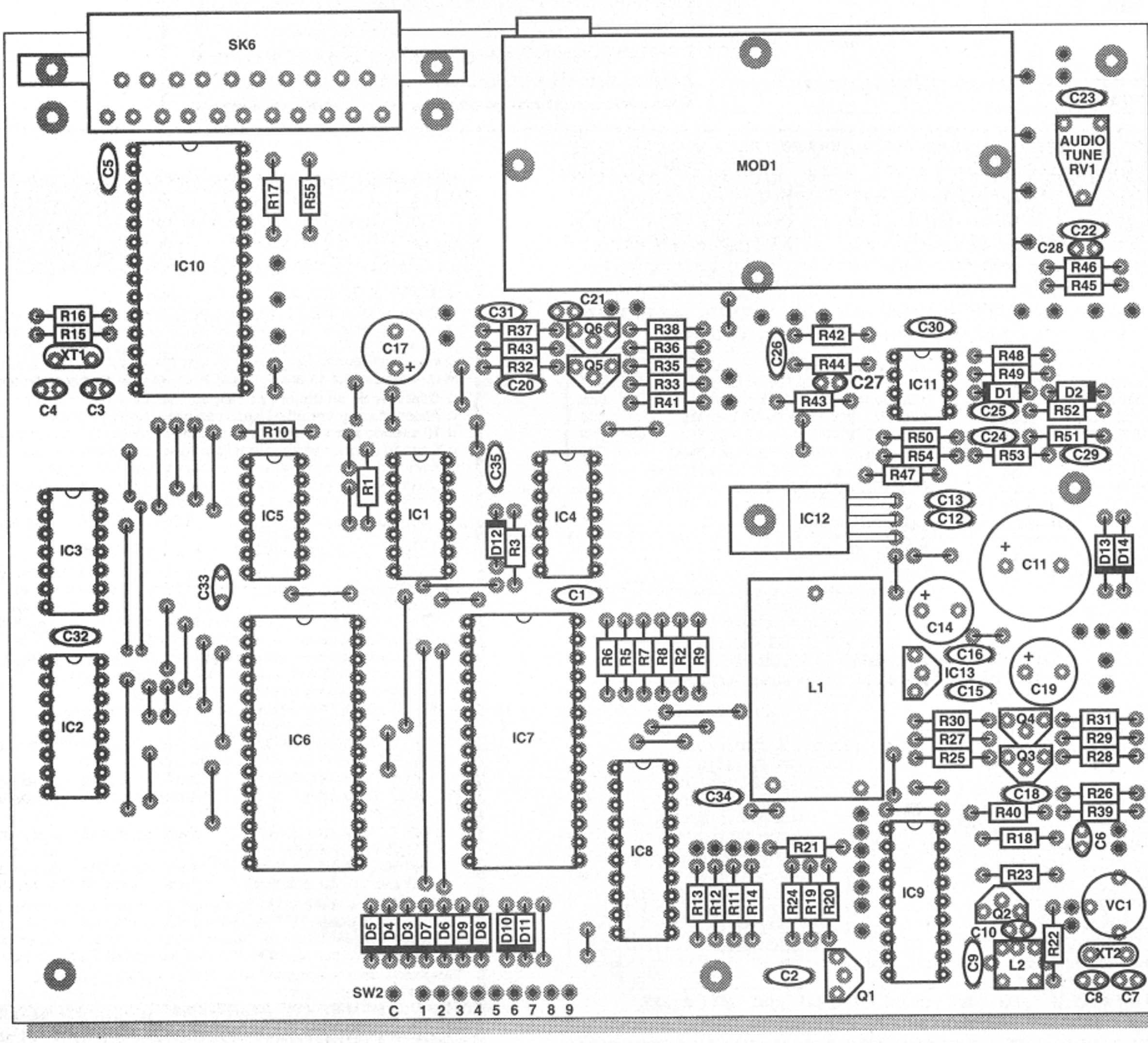


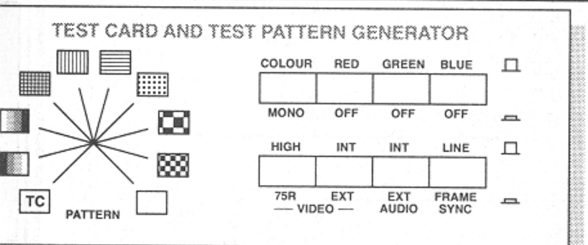
Fig.2 Component overlay of Test pattern generator

Q2,4,6	BC558
Q3,5	BF244
D1,2	2V7 400mW Zener
D3-12	1N4148
D13,14	1N4001

MISCELLANEOUS

MOD1	UM1286 UHF Modulator
SK1,2,3	Panel BNC Socket
SK4,5	Panel Phono Socket
SK6	R/A PCB SCART Socket
SW1,3-9	DPDT Latch Push Switch
SW2	1P/12W Rotary Switch
T1	240 to 12-0-12 6VA
XT1	5.000000 MHz
XT2	8.867238 MHz

IC sockets (1×8 way, 4×14 way, 1×16 way, 1×18 way, 1×20 way and 3×28 way), Knob for SW2, Buttons and brackets for SW1 & SW3-9 (Maplin FH61R & FH78K), PCB, case 170x70x190mm (WxWxD) or larger, coaxial cable, interconnection wire, tinned copper wire (about 24 SWG), 3 core 3 Amp mains flex, 13A mains plug with 3A fuse, phono plug to Co-ax aerial plug lead (Maplin FV90X), other leads as required, grommet, nuts, screws and spacers.



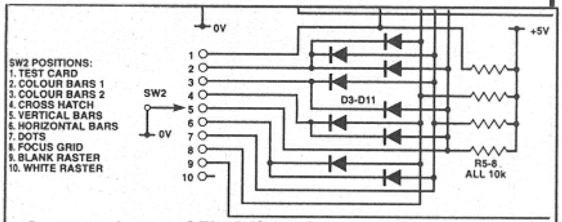
Front panel design

Part 1 corrections

Fig.1 The bottom left pin of SW7 should not be connectd to anything.

Fig.3 The junction at the bottom of R11-14 also joined to SW3-SW6 should be labelled 0V. The connections to SW2 pins 3 and 4 have become jumbled. See correct diagram below.

How It Works. The end of the fourth sentence in the second paragraph should read . . . so lines A0 to A7 count up from 0 to 255 (00h to FFh) and then to 0 and 1 (00h and 01h) again.



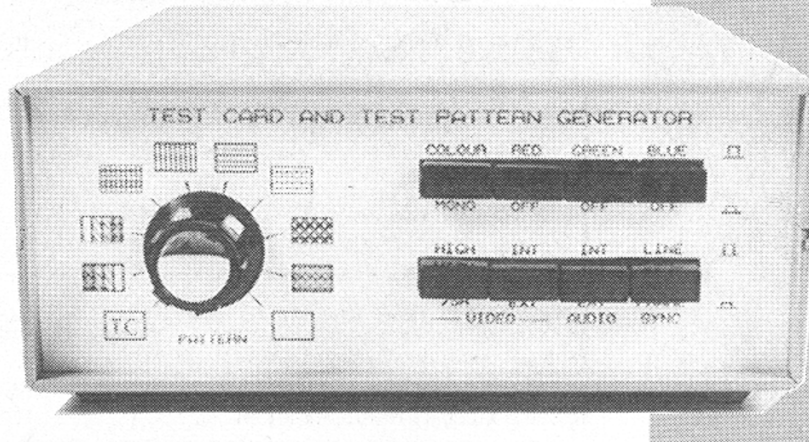
Corrected part of Fig.3 (from last month)

BUYLINES

All Components except IC6,IC7, & IC8 can be obtained from Maplin Electronic Supplies Ltd, the majority can probably also be obtained from your usual supplier. The Maplin Order Codes for the more obscure components are given in the parts list. The 74HC574 (IC6) & 27C128-15 (IC7/8) are listed by RS/Electromail and several other suppliers. The PCB is available from ETI PCB Service, see page 15.

EPROMs for this project can be programmed by the author at the following address: Paul Stenning, [redacted] Please enclose £5 to cover erasing if required, programming and return UK postage. Don't forget to enclose your own name & address and 2 EPROMs! If you prefer to program your own EPROMs, send an SAE for a HEX listing, or a blank PC formatted floppy disk (3.5" or 5.25") and return postage for an ASCII Hex Dump on your disk.

Paul Stenning provides some additional information



Since this project was published in the December 1991 and January 1992 issues of ETI, several errors have come to light (most were the fault of the author, not ETI), and a few small modifications have been carried out. Also a few of the components have proved difficult to obtain, so suppliers or alternatives have been found.

Test-card And Test Pattern Generator – An Update

Errors

Part 1 (December 1991)

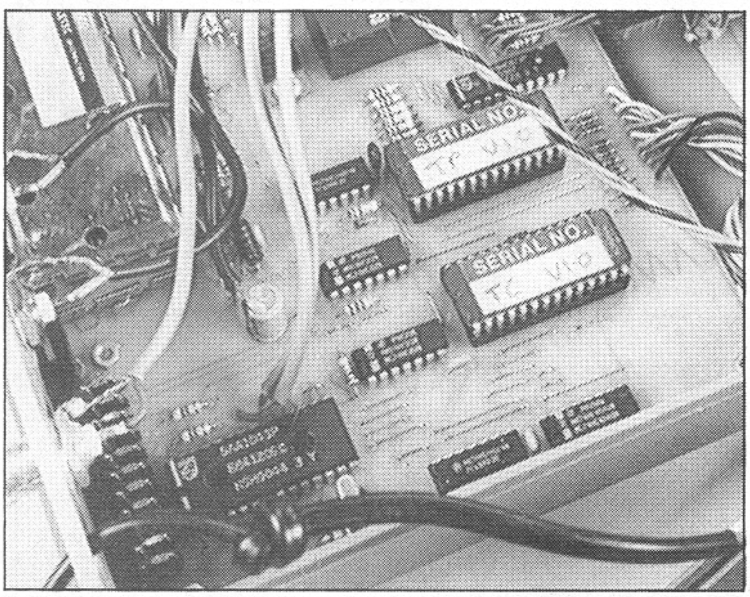
In Figure 1, the Int-Video-Out signal should go to SK6 pin 19, not pin 9 as shown.

Other errors in Part 1 are noted in Part 2.

Part 2 (January 1992)

In Figure 3, the Front Panel Design, two of the patterns around the Pattern Switch (SW2) are incorrect. The position shown as a coarse checkerboard pattern should be a fine checkerboard pattern, and the fine checkerboard pattern should be solid black. See the list in the diagram, in Part 1 corrections, on the same page.

In the Parts List, C21 & C28 should be 220p, and C26 should be 220n. The circuit diagram is correct.



In the PCB Component Overlay, Figure 2, the R43 between R37 and R32 should be R34.

Also in Figure 2, D13 and D14 are shown the wrong way round (ouch!). They should be mounted with the bar upwards (towards MOD1).

In Figure 1, the Interwiring Diagram, the bottom screened cable from SW8 to the PCB (near CV1), has the connections shown reversed at the PCB end.

Also in Figure 1, the Colour/Mono switch should be labeled SW6.

The author and ETI would like to apologise for these errors, particularly to anybody who has spent hours struggling with a non-working unit because of them.

Modifications

The wire from colour switch (SW6) to the PCB should be co-ax to prevent stray pickup affecting chrominance level, a hole is available on the PCB for the screen. The 0v link between SW6 and SW3 should be removed and the switch mounting brackets connected to 0v at SW5.

There was a slight, but significant problem of ringing on the video signal, particularly visible in the cross-hatch sections of the test-card pattern. This was caused by the luminance delay line, and after much experiment it was found that the only way to get rid of the problem was to remove the delay line completely, and replace it with it's equivalent resistance. The purpose of the delay line was to compensate for the delay caused to the chrominance signal by the chrominance filter circuit, so the chrominance filter had to go too. When the resulting video signal was examined on an oscilloscope the ringing was gone completely, the edges of the luminance signal were much sharper and the chrominance timing was spot on. The picture, when viewed on a high quality monitor via the scart socket, is much improved and the lack of a chrominance filter appears to have no adverse effects at all. To carry out this modification, remove L1 (delay line), L2 (15µH) and C10 (82p, next to L2). Fit a 910R resistor between the lower two holes of L1 (delay line) position. Yes—I know it's a waste of two pounds worth of bits—I'm sorry!

The video signal to MOD1 is slightly too high, to correct this, reduce R39 from 390R to 360R (4k7 in parallel with the 390R has the same effect).

Acknowledgements

The author would like to thank all those constructors who wrote to him with details of errors and problems. In particular he would like to thank Mr C. Oliver from Cheshire who provided the modifications and made several helpful comments. The Author would also like to hear from other constructors with their comments and suggestions, please write to the address given in Buylines in Part 2 of the project.

BUYLINES

It has come to the author's attention that 150ns 27C128 EPROM's are not too easy to come by. The prototype has since been tested with 250ns EPROM's which work fine. It should be noted that the EPROM's must be the CMOS 27C128 types, as normal 27128 devices consume far too much power and will overload IC13 (the 78L05 regulator) causing it to current limit.

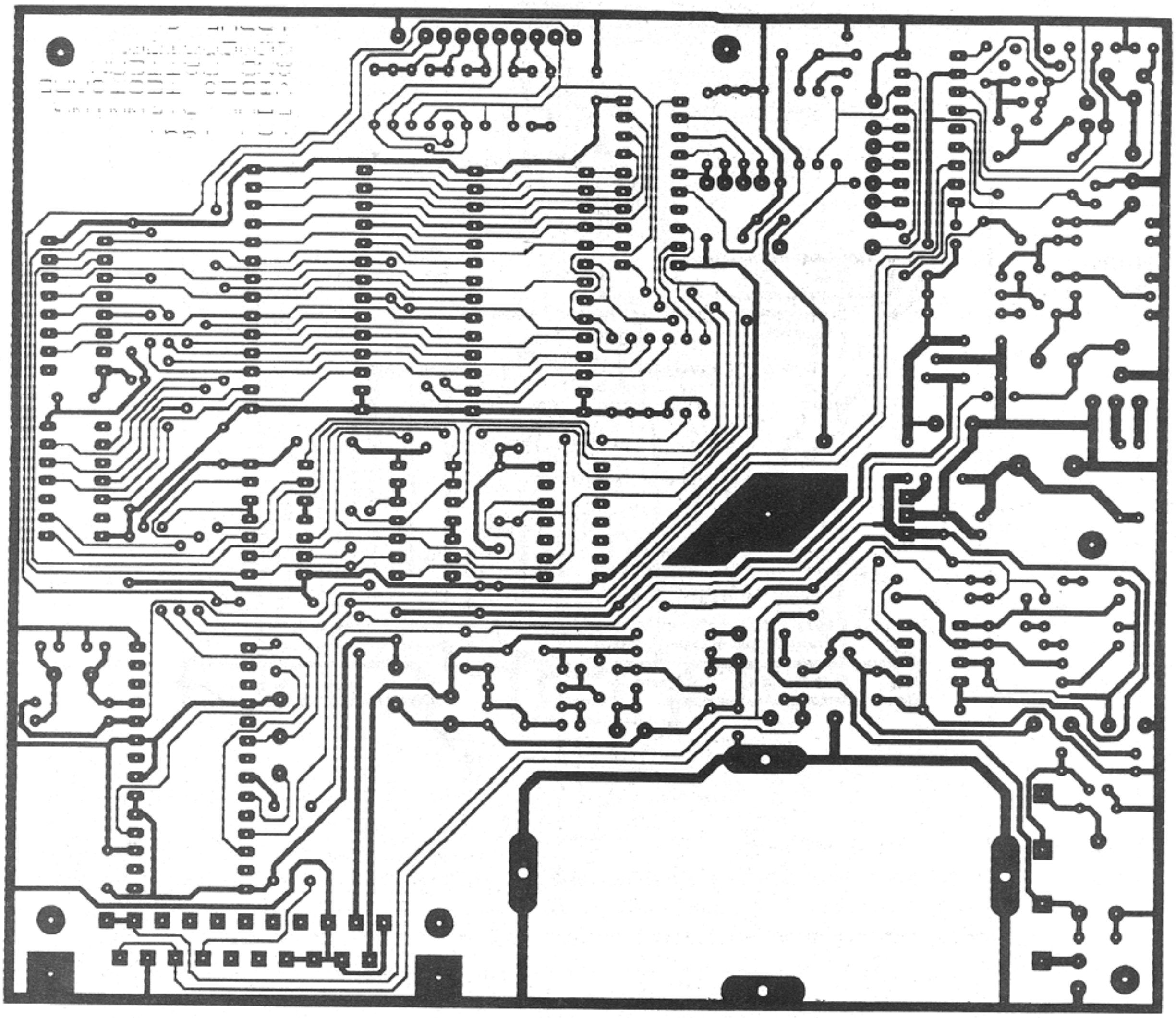
A few constructors have reported problems obtaining the 74HC574 IC, it is available from RS/Electromail and Cricklewood Electronics. Anyone who is repairing televisions and video recorders should definitely obtain a copy of the Cricklewood Electronics catalogue, since they stock almost every obscure IC and transistor you are likely to come across, as well as video heads, belts etc. Write to Cricklewood Electronics Ltd, 40 Cricklewood Broadway, London, NW2 3ET or 'phone 081 452 0161 (The author has no connection with this company, other than as a satisfied customer).

Maplin have recently changed their range of 0.1" pitch ceramic plate capacitors to ceramic disks with a 0.2" pitch, without changing the order codes! These will fit the PCB if the leads are bent, or the correct type can be obtained from RS/Electromail. Most other suppliers seem to omit the lead pitch of capacitors in their catalogues.

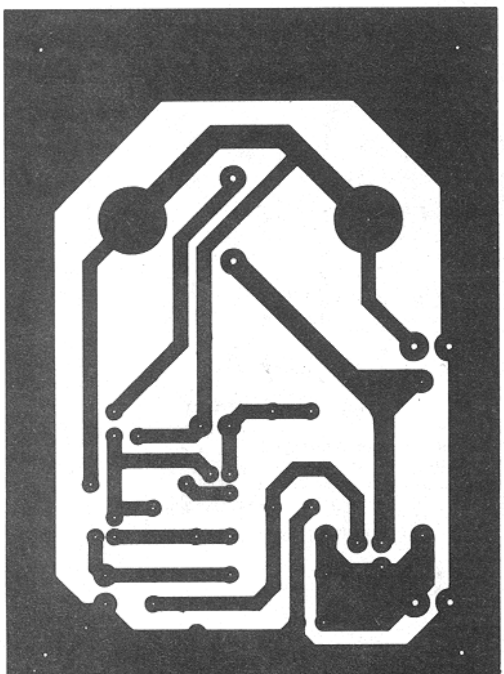
The Maplin order codes for the more critical or obscure parts are listed below:

CV1	22pF	TrimmerWL70M
IC9	TEA2000	UH66W
IC10	SAA1043	UK85G
MOD1	UM1286	BK66W
SK6	R/A	ScartFV89W
SW1,3-9	DPDT	LatchFH76X
XTAL1	5.000000	MHzUL51F
XTAL2	8.867238	MHzUH85G

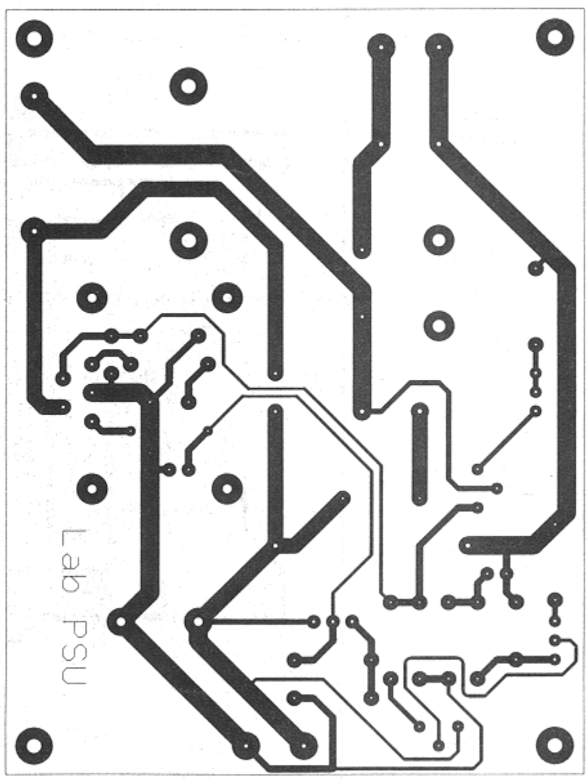
Regrettably the author can no longer offer a printed HEX listing of the EPROM data, since it runs to 64 pages of A4, which is expensive to photocopy and post, and the 32K of data would be almost impossible for anyone to type in without error! The EPROM programming and HEX dump to disk services are still available and will continue to be indefinitely. Please ensure that any disk you send to the author is formatted (several haven't been), and if writing from outside the UK please enclose 2 International Reply Coupons for return postage.



Test Card Generator Foil



Correct side to Power On
and Overload from last month



Switched Mode Laboratory Power Supply